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Studies in Econometric Method. By Cowles Commission Research Staff Members. Edited by William C. Hood and Tjalling C. Koopmans. New York: John Wiley & Sons, 1953. Pp. xix, 323. \$5.50.

Studies in Econometric Method is the fourteenth monograph in the very excellent series of publications turned out by the Cowles Commission for Research in Economics since its founding in 1932. It consists of a somewhat less technical presentation of some of the contents of Monograph No. 10, *Statistical Inference in Dynamic Economic Models* (1950, 438 pages), and some of the results of more recent studies and further research in econometric methods since 1950.

This monograph is concerned with the construction of econometric models involving problems of specification, identification, estimation, and the computation of estimates. The problems discussed arise largely from the nonexperimental nature of economic data, which are usually thought of as generated by the simultaneous validity of various behavior relationships. The application of statistical methods to a given set of observations or data has to depend mainly on preconceptions as to the nature and persistence of behavior relationships. To be realistic unobserved random variables have to be introduced to represent "shocks" in behavior relations and "errors" in measurement. For purposes of simplification, the analysis is largely concentrated on "shock" models that neglect errors of measurement. However reference is made to other studies involving "error" and "shock-error" models, and two case studies of specification error are included in the book.

Volume No. 14 is a symposium of 10 studies, three of which are reprinted in whole or in part from earlier journal articles. The first chapter, "Economic Measurements for Policy and Prediction," by Jacob Marschak, which discusses the relationship of economic theory to statistical method in econometrics and the uses of econometrics in making predictions and policy decisions, serves as the introduction to the book. Chapter 2 (reprinted¹), "Identification Problems in Economic Model Construction," by Koopmans, discusses the concept and criteria of identifiability of the parameters of economic behavior. Chapter three, "Causal Ordering and Identifiability," by Herbert A. Simon, provides new information on the concept of a complete model, and utilizes the idea of a causal ordering of variables and equations.

Chapter 4 (reprinted²), "Methods of Measuring the Marginal Propensity to Consume," by Trygve Haavelmo, is now a classic in its field. It illustrates the use of the least-squares method of estimation in terms of simple models and the consumption function. Chapter 5 (reprinted in part³), "Statistical Analysis of the Demand for Food: Examples of Simultaneous Estimation of Structural Equations," by Girshick and Haavelmo, discusses maximum-likelihood estimation procedures and their application to demand and supply equations for food. Chapter 6, "The Estimation of Simultaneous Linear Economic Relationships," by Koopmans and Hood, is a thoroughgoing statement of the large-sample

¹ *Econometrica*, Vol. 17, April, 1949, pp. 125-144.

² *Journal of the American Statistical Association*, Vol. 42, March, 1947, pp. 105-122.

³ *Econometrica*, Vol. 15, April, 1947, pp. 79-110.

theory of maximum-likelihood estimation in a shock model involving linear equations and normally distributed disturbances. Chapter 7, "Asymptotic Properties of Limited-Information Estimates Under Generalized Conditions," by Chernoff and Rubin, extends the analysis and methodology of the previous chapter under more general conditions.

Chapter 8, "An Example of Loss of Efficiency in Structural Estimation," by S. G. Allen, Jr., and Chapter 9, "Sources and Size of Least-Squares Bias in a Two-Equation Model," by Jean Bronfenbrenner, illustrate particular cases of specification error. The last chapter, "The Computation of Maximum-Likelihood Estimates of Linear Structural Equations," by Chernoff and Divinsky, presents various procedures for obtaining maximum-likelihood estimates of simultaneous economic relations and some of the detailed worksheets are included for illustrative purposes. Lastly the main principles of notation are explained in the forepart of the volume, and a list of references is provided at the back of the book.

As a whole the monograph is well written, and it represents an important and pioneering contribution to the field of economics and econometrics. Unfortunately much of it is beyond the grasp of the large body of economists not well grounded in advanced mathematics and statistics. In this connection it would be extremely helpful if the Cowles Commission would also make the results of its original investigations and methodology available to this large group of economists. Suggestive perhaps is what Robert Dorfman attempts to do in a limited way in his recent article in the *American Economic Review*⁴, "Mathematical, or 'Linear,' Programming: A Nonmathematical Exposition." It is to be hoped that something along this line might be both possible and feasible in the not too distant future.

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A Study of Moneyflows in the United States. By Morris A. Copeland. New York: National Bureau of Economic Research, 1952. Pp. xxxii, 338, A241. \$7.50.

This important volume is the fruit of some half dozen years of work, first under the sponsorship of the Committee for Economic Development, and later under the auspices of the Board of Governors of the Federal Reserve System. Following lines suggested by Wesley C. Mitchell in an unpublished manuscript, Professor Copeland applies the principles of accounting to the transactions that take place among the various economic agents of the country. The result is both a technique for analyzing moneyflows and a series of estimates of these flows for the seven years, 1936-1942, that were covered by the study.

The exposition of the technique is intricate, but is done with extreme care and thoroughness. Since all money-flow transactions are debits to one party and credits to another, the problem is to draw up a statement of money receipts and dispositions that must of necessity balance. Both the traditional equation, $PT = MV$ and the Keynesian formulae covering saving and investment are rejected as being too aggregative to reveal the flows that take place among the different groups of transactors.

⁴ Vol. 43, Dec., 1953, pp. 797-825.